



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/711,700	09/30/2004	Kevin S. Petrarca	FIS920040258US1	5699
32074	7590	09/22/2006	EXAMINER	
INTERNATIONAL BUSINESS MACHINES CORPORATION DEPT. 18G BLDG. 300-482 2070 ROUTE 52 HOPEWELL JUNCTION, NY 12533			NGUYEN, TRAM HOANG	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 09/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	10/711,700		PETRARCA ET AL.	
	<b>Examiner</b>		<b>Art Unit</b>	
	Tram H. Nguyen		2818	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 August 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 6-12 and 16-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 13-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 September 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>See Continuation Sheet</u> .                                  | 6) <input type="checkbox"/> Other: _____                          |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :04/17/2006,01/17/2006 and 01/12/2006.

## DETAILED ACTION

### *Claim Rejections - 35 U.S.C. § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-5 and 13-15 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Andricacos et al. (U.S. Patent No. 6,709,562 B1) (hereinafter Andricacos).

Regarding **claim 1**, Andricacos discloses a copper interconnect (fig. 6) comprising: an impure copper seed layer (reference numeral 5) derived from an impure copper source with a content of impurities that is deposited on a barrier layer (reference numeral 4), said barrier layer (4) prevents substantial diffusion of copper through to an

Art Unit: 2818

underlying insulating layer (reference numeral 1); an impure copper (reference numeral 6) derived from an impure copper source with a content of impurities that fills an opening in said underlying insulating layer (6) that is deposited on said impure copper seed layer (5). Although Andricacos does not explicitly teach the material composition of said seed layer is substantially the same as material composition of said impure copper fill, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the same material composition for both the impure copper seed layer and the impure copper fill, since it is going to lower the cost of making the product.

Regarding **claim 2**, Andricacos discloses all the limitations of the claimed invention for the same reasons are set-forth above except for the copper source of said impure copper seed layer is equivalent to said copper source of said impure copper. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the same material composition for both the impure copper seed layer and the impure copper fill, since it is going to lower the cost of making the product.

Regarding to **claim 3**, Andricacos discloses all the limitations of the claimed invention; on another hand, the Applicant admits the copper in the impure copper seed layer and the electroplated copper are both derived from a source with an impurity content of not more than 1.2 % by weight and not less than or equal to 0.001% by weight are general well-known impure copper sources (present Invention's specification: pg. 5, par. 20, lines 4-9).

Regarding **claim 4**, Andricacos discloses all the limitations of the claimed invention for the same reasons are set-forth above except for explicitly teaching the impure copper in said impure copper seed layer is substantially equivalent to said impure copper. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the same material composition for both the impure copper seed layer and the impure copper fill, since it is going to lower the cost of making the product.

Regarding **claim 5**, Andricacos discloses all the limitations of the claimed invention for the same reasons are set-forth above; besides Andricacos also discloses the copper in said impure copper source comprises chosen from the group of C, Cl, N, O and S (col. 8, lines 41-46).

Regarding **claim 13**, Andricacos discloses a copper interconnect (fig. 6) comprising: an insulating layer that has an opening (reference numeral 1); a barrier layer (reference numeral 4) that prevents substantial diffusion of copper through to said underlying insulating layer that is deposited on said underlying insulating layer and lines said opening; an impure copper seed derived from an impure copper seed with content of impurity that is deposited on said barrier layer and fills said opening (fig. 6); an impure copper (reference numeral 6) derived from an impure copper source with a content of impurities that fills an opening in said underlying insulating layer (6) that is deposited on said impure copper seed layer (5). Although, Andricacos does not explicitly teach the material composition of said impure copper layer is substantially the

same as material composition of said impure copper fill, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the same material composition for both the impure copper seed layer and the impure copper fill, since it is going to lower the cost of making the product.

Regarding **claim 14**, Andricacos discloses all the limitations of the claimed invention; on another hand, the Applicant admits the copper in the impure copper seed layer and the electroplated copper are both derived from a source with an impurity content of not more than 1.20 % by weight and not less than or equal to 0.001% by weight are general well-known impure copper sources (present Invention's specification: pg. 5, par. 20, lines 4-9).

Regarding **claim 15**, Andricacos discloses all the limitations of the claimed invention for the same reasons are set-forth above; besides Andricacos also discloses the copper in said impure copper source comprises chosen from the group of C, Cl, N, O and S (col. 8, lines 41-46).

### ***Conclusion***

5. A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tram H. Nguyen whose telephone number is (571)272-

Art Unit: 2818

5526. The examiner can normally be reached on Monday-Friday, 8:30 AM – 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax numbers for all communication(s) is (703)872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571)272-1625.

**THN**  
Art Unit 2818  
Sept 13<sup>th</sup>, 2006

*Andy Nguyen*  
Primary Examiner